Construction Air Permit Application
TMP Bleaching Project

Prepared For

BOWATER

Bowater Coated and Specialty Papers Division
Catawba, South Carolina

December 2004

1.0 Introduction

Bowater Coated and Specialty Papers Division (Bowater) manufactures coated paper and market pulp at their Catawba, South Carolina facility. Bowater is considering a thermo-mechanical pulp (TMP) bleaching project to improve the quality of the coated paper produced at the mill.

2.0 Project Description

The TMP bleaching project involves increasing the brightness of the TMP pulp used in the manufacturing of coated paper. The TMP pulp brightness will be increased by applying hydrogen peroxide. The hydrogen peroxide will be applied using some existing equipment from the retired kraft bleaching system. The old bleach plant E_0 tower and several stock and filtrate chests will be re-commissioned for this project. These sources were retired from service when the new fiberline and new bleaching system were placed in operation in 2003. The project also includes the installation of a new mixer, pumps, belt presses, and conveyors.

The TMP bleaching system is expected to process up to 375 tons per day of TMP pulp. The additional brightness will improve coated paper quality, and also require slightly less kraft pulp in the coated sheet. The reduced kraft pulp content in the coated sheet will allow coated paper production to be increased by approximately 16,250 tons per year. The increased coated paper production is expected to be produced on the No. 3 paper machine.

The No. 3 paper machine was converted to coated paper in March 2003, and currently has a production limit of 366,667 air dried tons of finished paper (ADTFP). In August 2004, final optimization of the No. 3 paper machine was completed, and monthly production achieved 99% of current permitted capacity. With the additional kraft pulp becoming available from the TMP bleaching project, the optimized No. 3 paper machine will be capable of exceeding the currently permitted production rate.

Bowater is requesting the annual production limit for the No. 3 paper machine be increased by 16,250 ADTFP to 382,917 ADTFP. The No. 3 paper machine is capable of operating at this higher production level without any physical modifications.

The TMP bleaching equipment is expected to require approximately 1,875 pounds per hour of steam from the powerhouse. Approximately 9,270 additional pounds per hour of steam will be required to process the additional kraft pulp using the No. 3 paper machine.

South Carolina construction permit application forms for the TMP bleaching equipment are contained in Appendix A. A process flow diagram for the TMP bleaching equipment is presented in Appendix B.

3.0 Emission Estimates

The potential VOC emissions from the TMP bleaching equipment are expected to be small, due to the use of hydrogen peroxide to brighten the pulp. The HAP emissions are expected to be primarily methanol, and are expected to be slightly lower than the VOC emissions. The TMP bleaching system emission estimates are contained in Appendix C.

The actual VOC emissions from the additional 16,250 tons of coated paper are presented in Appendix D. Since the No. 3 paper machine has been manufacturing coated paper less than two-years, and began operating at current permitted capacity in August 2004, the past actual emissions are assumed to equal the potential emissions, consistent with the 1990 draft New Source Review Manual (page A.41). Therefore, only the VOC emissions due to increasing the permitted capacity by 16,250 tons are estimated.

The emissions from the additional 11,145 pounds per hour of steam to operate the TMP bleaching equipment and process the additional production through the No. 3 paper machine are presented in Appendix E. The additional steam will be provided by the No.1 and No. 2 Combination Boilers. The additional steam required will not exceed the capacity of the boilers.

A summary of the emissions (tpy) resulting from the project is presented below:

	PM/PM_{10}	SO_2	NO_X	CO	VOC
TMP Bleaching	0	0	0	0	8.2
No. 3 Paper Machine	0	0	0	0	1.4
Steam Increase	5.7	38.2	15.1	32.5	1.9
Total Project	5.7	38.2	15.1	32.5	11.5
NSR Threshold	25/15	40	40	100	40
NSR Required?	No	No	No	No	No

4.0 Applicable Regulations

4.1 40 CFR Part 63, Subpart S – Pulp and Paper Bleaching System (MACT I) Standards

The pulp and paper MACT (Subpart S) regulates bleaching systems using chlorine and chlorine dioxide at mechanical pulp (TMP) mills. Since no chlorine or chlorine dioxide will be used, Subpart S does not apply. In addition, the preamble to Subpart S states that case-by-case MACT does not apply.

4.2 South Carolina 62.5, Standard No. 7 - Prevention of Significant Deterioration (PSD)

The emissions increase from the project will not exceed any significant emission increase levels requiring a PSD or non-attainment new source review permit.

4.3 South Carolina 62.5, Standard No. 5.1 – BACT/LAER for Volatile Organic Compounds

The VOC emissions from the project are expected to be less than 100 tpy. In addition, since 1979 the VOC emissions from the facility have decreased. Therefore, Standard 5.1 does not apply to the project.

4.4 South Carolina 62.5, Standard No. 5.1 – Control of Oxides of Nitrogen (NO_X)

The TMP bleaching equipment does not emit NO_X. The combination boilers will provide steam for the project, but no modifications to the boilers (or burners) will be required. The No. 3 paper machine will not be modified, and no modifications to the burners in the coating section are required. In addition, the No. 3 paper machine was issued a PSD construction permit in 2001, and a low NO_X burner was installed as BACT for the air flotation dryer. Therefore, Standard 5.2 does not apply to the project.

4.5 South Carolina 62.5, Standard No. 8 – Toxic Air Pollutants

South Carolina Standard No. 8 (toxic air pollutants) is not applicable since MACT Subpart S examined non-chlorine bleaching of mechanical pulp, and determined that HAP emissions are low and do not require case-by-case MACT determinations. In other words, the TMP bleaching systems complies with all MACT standards due to its low level of HAP emissions. Therefore, it is exempt from Standard No. 8.

5.0 Air Quality Impact Analysis

The PM/PM_{10}, SO_2, and NO_X emissions resulting from the increased steam required from the combination boilers were modeled to determine compliance with the Standard No. 7 PSD Increments. The maximum emissions from the combination boilers will not increase as a result of this project, so the previous Standard No. 2 modeling analysis is still valid.

The maximum predicted impacts from the increased PM/PM_{10}, SO_2, and NO_X emissions were added to the Standard No. 7 modeling results submitted in April 2004 to determine facility compliance. The emission increases were prorated for combination boilers No. 1 and No. 2 using the same percentage for each boiler as previous modeling analysis (approximately 43%/57% for boilers 1/2).

The stack parameters, emission rates, building downwash, receptor grids, model sources, etc., are the same as those used for recent modeling for other construction permit applications.

The results of the air dispersion modeling analysis indicate that the emissions for PM_{10}, SO_2, and NO_X will not cause or contribute to an exceedance of the PSD Class II increments. A summary of the modeling results for compliance with the PSD Increment is presented in Table 5.1.

Table 5.1
Standard No. 7 (PSD Increments) Compliance Demonstration
Bowater Coated Paper Division

Pollutant	Averaging Period	Maximum Off-Site Concentration (ug/m^3)			Standard No. 7	Compliance Demonstrated?
		April 2004	TMP Bleaching	Facility Total		
PM_{10}	24-Hour	22.99	0.11	23.10	30	Yes
	Annual	0.57	0.01	0.58	17	Yes
SO_2	3-Hour	348.42	1.94	350.36	512	Yes
	24-Hour	77.00	0.62	77.62	91	Yes
	Annual	6.19	0.05	6.24	20	Yes
NO_X	Annual	9.73	0.02	9.75	25	Yes

Notes: Facility impacts are from ISCST3 analysis using 5 years of meteorological data.
Annual averages are maximum concentrations.
Short-term averages (24-hours and less) are second-highest concentrations.

APPENDIX A

Construction Permit Application Forms

D H E C
PROMOTE PROTECT PROSPER

Part I Permit Application Form
Bureau of Air Quality

Please Refer To Instructions On Back Before Completing This Form

1. Air Permit Number for Existing Plant: **2440-0005**
2. Company Name for Permit: **Bowater Coated and Specialty Papers Division**
3. Mailing Address: **P.O. Box 7**
   City: **Catawba** State: **SC** Zip Code: **29704**
4. Plant Location (Street or Highway) **5300 Cureton Ferry Road**
   City: **Catawba** State: **SC** Zip Code: **29704** County: **York**
5. Person to Contact: **Dale Herendeen** Phone No. **803 981-8009**
6. Standard Industrial Classification (SIC) Code for Plant: **2611**
7. Attach the following applicable part(s) for each emission source:
   A. Number of Fuel Burning Applications (Part IIA):
   B. Number of Process Applications (Part IIB): **1**
   C. Number of Incinerator Applications (Part IIC):
   D. Number of Asphalt Plant Applications (Part IID):
   E. Number of Dry Cleaner Applications (Part IIE):
   F. Number of Concrete Batch Plant Permit Applications (Part IIF):
   G. Number of Storage Vessel Permit Applications (Part IIG/Part IIGa)
8. Application Type ☐ Operating Renewal Existing Sources Construction Date:
   ☒ NEW Construction Start Date: **January 2005** Finish Date: **December 2005**
9. Signatures:

I certify, to the best of my knowledge and belief, that no undseriable levels of air pollutants will be created and no applicable standards and/or regulations will be contravened or violated. I understand that any statements and/or descriptions which are found to be incorrect may result in the immediate revocation of any permit issued pursuant to this application.

Dale Herendeen ENV. MGR 12/23/04
Company Official Signature Title/Position Date

I have placed my signature and seal on the engineering documents submitted, signifying that I accept responsibility for the accuracy of this application as it pertains to DHEC Air Pollution Regulation 61-62.

Professional Engineer Signature 15361 12/20/04
S.C. Registration No. Date

If the consultant or professional engineer that prepared this application desires a copy of issued permit(s), please complete the information below.

Name/Consulting Firm: **URS Corporation**

Address: **2510-C3 Wade Hampton Boulevard** City: **Greenville**

State: **South Carolina** Zip Code: **SC** Phone No.: **29615**

*****INCOMPLETE APPLICATIONS WILL BE RETURNED*****

DHEC 1924 (07/1997)

D H E C
PROMOTE PROTECT PROSPER

Process Permit Application
Bureau of Air Quality
Part IIB

1. Company Name: **Bowater Coated and Specialty Papers Division**

   Process Description: **TMP Bleaching System**

   Process SIC Code: **2621 (non kraft pulping)**

   Process Unit Designation: **TMP Bleaching System**

2. Major Raw Materials: **Unbleached TMP Pulp** — Quantity Used: **375 air dried short tons per day**

   Hydrogen Peroxide — **6920 gallons per day**

   Products: **Bleached TMP Pulp** — Rated Production: **375 air dried short tons per day**

3. Fuel Data (indicate all units):

Fuel Type and Grade	BTU Content	% Sulfur by weight	% Ash by weight	Consumption @ rated capacity
Not Applicable	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**

4. Air Pollution Control Device Description: **Not applicable**

5. Stack Data:

   Height Above Ground: **170** ft. — Gas Velocity: **34** ft/.sec

   Inside Diameter: **2.0** ft. — Temperature: **140** °F

   Est. Moisture: **unknown** % — Location (UTM or Lat./Long): **510.837E, 3855.646N**

6. Emission Rate at rated capacity (lb/hr.):

Pollutant	Before Control Device	After Control Device	Method of Estimating Emissions
Particulate Matter	**Not Applicable**	**Not Applicable**	**Not Applicable**
SO_2	**Not Applicable**	**Not Applicable**	**Not Applicable**
CO	**Not Applicable**	**Not Applicable**	**Not Applicable**
NO_x	**Not Applicable**	**Not Applicable**	**Not Applicable**
VOC's	**1.87 lb/hr**	**1.87 lb/hr**	**Engineering Estimate**
Other (specify):			
HAPs (Methanol)	**1.72 lb/hr**	**1.72 lb/hr**	**Engineering Estimate**

7. Are any of the collected materials subject to the provisions of the S.C. Hazardous Waste Management Act or Regulations? (specify): **Not Applicable**

8. Normal Operating Schedule: **24** hours/day **7** days/week **52** weeks/year

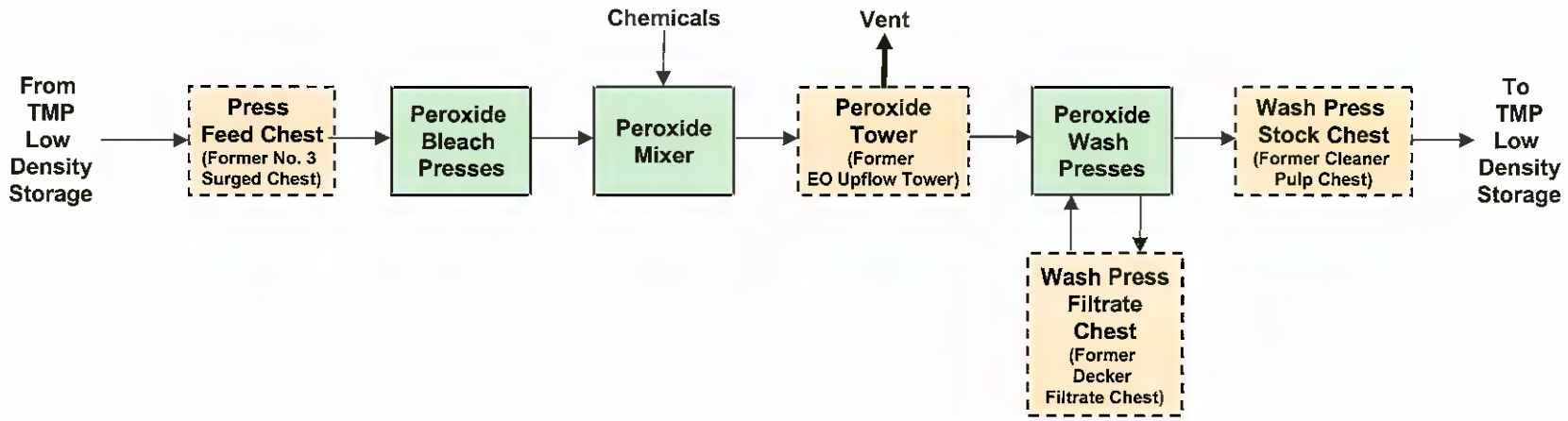
   Seasonal Variation: Dec.-Feb. **25** % Mar.-May **25** % June-Aug. **25** % Sept.-Nov. **25** %

9. How will waste material from process and control equipment be disposed of?

   Not Applicable

APPENDIX B

Process Flow Diagram
TMP Bleaching System



- - - - Existing Equipment

—— New Equipment

BOWATER

Bowater Coated Paper Division
Catawba, South Carolina

APPENDIX C

Emissions Calculations
TMP Bleaching System

TMP Bleaching

Maximum Production = 375 ADSTP/day (air dried short tons pulp/day)

Volatile Organic Compound (VOC) Emissions

Emission factors from NCASI FPAC Study

3-Carene = 2.20E-3 kg/MTP (kg/metric ton pulp)

Formaldehyde = 2.20E-3 kg/MTP

Methanol = 5.51E-2 kg/MTP

Methylene Chloride = 2.70E-4 kg/MTP

Total VOC = 2.20E-3 + 2.20E-3 + 5.51E-2 + 2.70E-4 = 0.05977 kg/MTP

1 kg = 2.2 lb

1 metric ton = 2,200 lb

1 short ton = 2,000 lb

0.05977 kg/MTP × 2.2 lb/kg × MTP/2,200lb × 2,000 lb/ADSTP = 0.120 lb/ADSTP

375 ADSTP/day × 0.120 lb/ADSTP × 1 day/24 hr = 1.87 lbs/hr

1.87 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 8.2 tons/yr

Hazardous Air Pollutants (Methanol) Emissions

Emission factor from NCASI FPAC Study - Methanol = 5.51E-2 kg/MTP

1 kg = 2.2 lb

1 metric ton = 2,200 lb

1 short ton = 2,000 lb

0.0551 kg/MTP × 2.2 lb/kg × MTP/2,200lb × 2,000 lb/ADSTP = 0.110 lb/ADSTP

375 ADSTP/day × 0.110 lb/ADSTP × 1 day/24 hr = 1.72 lbs/hr

1.72 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 7.5 tons/yr

APPENDIX D

Emissions Calculations
Increased Coated Paper Production

No. 3 Coated Paper Machine

Production increase = 16,250 ADSTFP/year

= 44.5 ADSTFP/day

Volatile Organic Compound (VOC) Emissions

VOC Emission factor from NCASI TB 740 = 0.17 pound/ADSTFP

44.5 ADSTFP/day × 0.17 lb/ADSTFP × 1 day/24 hr = 0.32 lb/hr

0.32 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 1.4 tons/yr

APPENDIX E

Emissions Calculations

Increased Steam Usage

Combination Boilers

TMP bleaching system production = 375 ADST/day

Steam required = 375 ADST/day × 120 lb steam/ADST = 45,000 lb steam/day

Additional No. 3 coated paper machine production = 44.5 ADSTFP/day

Steam required = 44.5 ADSTFP/day × 5,000 lb steam/ADSTFP = 222,500 lb steam/day

Increased steam demand = 45,000 lb/day + 222,500 lb/day = 267,500 lb steam/day

Fuel Usage

Heat value of steam = 267,500 lb steam /day × 1,400 Btu/lb steam × 1 day/24 hr

= 15.602 MM Btu/hr

According to mill records, the combination boilers generated steam from bark (73%), natural gas (1%), No. 6 fuel oil (21%), and tire-derived fuel (5%) combustion.

Addition of heat from Bark = 15.60 MM Btu/hr × (0.73) = 11.39 MM Btu/hr

Addition of heat from Natural Gas = 15.60 MM Btu/hr × (0.01) = 0.16 MM Btu/hr

Addition of heat from No. 6 fuel oil = 15.60 MM Btu/hr × (0.21) = 3.28 MM Btu/hr

Addition of heat from TDF = 15.60 MM Btu/hr × (0.05) = 0.78 MM Btu/hr

Particulate Matter (PM/PM_{10}) Emissions

Addition from Bark Combustion:

Increased Heating Requirements = 11.39 MM Btu/hr

Emission factor from 2004 stack test = 0.084 lb/MM Btu

11.39 MM Btu/hr × 0.084 lb/MM Btu = 0.96 lb/hr

0.96 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 4.2 tons/yr

Addition from Natural Gas Combustion:

Increased Heating Requirements = 0.16 MM Btu/hr

Emission factor from 2004 stack test = 0.084 lb/MM Btu

0.16 MM Btu/hr × 0.084 lb/MM Btu = 0.01 lb/hr

0.01 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.1 ton/yr

Addition from No. 6 Fuel Oil Combustion:

Increased Heating Requirements = 3.28 MM Btu/hr

Emission factor from 2004 stack test = 0.084 lb/MM Btu

3.28 MM Btu/hr × 0.084 lb/MM Btu = 0.28 lb/hr

0.28 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 1.2 tons/yr

Addition from Tire-Derived Fuel (TDF) Combustion:

Increased Heating Requirements = 0.78 MM Btu/yr

Emission factor from 2004 stack test = 0.084 lb/MM Btu

0.78 MM Btu/hr × 0.084 lb/MM Btu = 0.07 lb/hr

0.07 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.3 tons/yr

Total Emissions:

0.96 + 0.01 + 0.28 + 0.07 = 1.32 lb/hr

4.2 + 0.1 + 1.2 + 0.3 = 5.8 tons/year

Sulfur Dioxide (SO_2) Emissions

Addition from Bark Combustion:

Increased Heating Requirements = 11.39 MM Btu/hr

Emission factor from AP-42 = 0.025 lb/MM Btu

11.39 MM Btu/hr × 0.025 lb/MM Btu = 0.29 lb/hr

0.29 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 1.2 tons/yr

Addition from Natural Gas Combustion:

Increased Heating Requirements = 0.16 MM Btu/hr

Emission factor from AP-42 = 0.6 lb/10^6 cf

0.6 lb/10^6 cf × 1 cf/1,000 Btu × 10^6 Btu/1 MM Btu = 6.0E-4 lb/MM Btu

0.16 MM Btu/hr × 6.0E-4 lb/MM Btu = 9.6E-5 lb/hr

9.6E-5 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 4.2E-4 tons/yr

Addition from No. 6 Fuel Oil Combustion:

Increased Heating Requirements = 3.3 MM Btu/hr

Emission factor from AP-42 = 157S lb/10^3 gal

Assume S = 2.1%

(157 × 2.1) lb/10^3 gal × 1 gal/150,000 Btu × 10^6 Btu/ 1 MM Btu = 2.2 lb/MM Btu

3.28 MM Btu/hr × 2.2 lb/MM Btu = 7.20 lb/hr

7.20 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 31.6 tons/yr

Addition from Tire-Derived Fuel (TDF) Combustion:

Increased Heating Requirements = 0.78 MM Btu/yr

Sulfur content of TDF = 1.23% (EPA 600/R-97-115, Table 16)

0.0123 lb S/lb × 64 lb SO_2/32 lb S × lb/15,500 Btu × 10^6 Btu/MM Btu = 1.6 lb/MM Btu

0.78 MM Btu/hr × 1.6 lb/MM Btu = 1.24 lb/hr

1.24 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 5.4 tons/yr

Total Emissions:

0.29 + 0.00 + 7.20 + 1.24 = 7.73 lb/hr

1.2 + 0.0 + 31.6 + 5.4 = 38.2 tons/year

Nitrogen Oxide (NOx) Emissions

Addition from Bark Combustion:

Increased Heating Requirements = 11.39 MM Btu/hr

Emission factor from NCASI TB 646 = 1.76 lb/twwf

1.76 lb/twwf × 1 twwf/2,000 lb × 1 lb/4,500 Btu × 10^6 Btu/1 MM Btu = 1.96E-1 lb/MM Btu

11.39 MM Btu/hr × 1.96E-1 lb/MM Btu = 2.23 lbs/hr

2.23 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 9.8 tons/yr

Addition from Natural Gas Combustion:

Increased Heating Requirements = 0.16 MM Btu/hr

Emission factor from AP-42 = 280 lb/10^6 cf

280 lb/10^6 cf × 1 cf/1,000 Btu × 10^6 Btu/1 MM Btu = 2.8E-1 lb/MM Btu

0.16 MM Btu/hr × 2.8E-1 lb/MM Btu = 0.04 lb/hr

0.04 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.2 ton/yr

Addition from No. 6 Fuel Oil Combustion:

Increased Heating Requirements = 3.28 MM Btu/hr

Emission factor from AP-42 = 47 lb/10^3 gal

47 lb/10^3 gal × 1 gal/150,000 Btu × 10^6 Btu/1 MM Btu = 3.13E-1 lb/MM Btu

3.28 MM Btu/hr × 3.13E-1 lb/MM Btu = 1.03 lbs/hr

1.03 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 4.5 tons/yr

Addition from Tire-Derived Fuel (TDF) Combustion:

Increased Heating Requirements = 0.78 MM Btu/yr

Assume same as Bark = 0.196 lb/MM Btu

(EPA "Air Emission from Scrap Tire Combustion (600/R-97-115), Page 35 states emissions are similar to other fuels. Therefore assume similar to bark, which is 75% of the total heat input)

0.78 MM Btu/hr × 0.196 lb/MM Btu = 0.15 lb/hr

0.15 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.7 ton/yr

Total Emissions:

2.23 + 0.04 + 1.03 + 0.15 = 3.45 lbs/hr

9.8 + 0.2 + 4.5 + 0.7 = 15.1 tons/year

Carbon Monoxide (CO) Emissions

Addition from Bark Combustion:

Increased Heating Requirements = 11.39 MM Btu/hr

Emission factor from AP-42 = 0.60 lb/MM Btu

11.39 MM Btu/hr × 0.60 lb/MM Btu = 6.84 lbs/hr

6.84 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 29.9 tons/yr

Addition from Natural Gas Combustion:

Increased Heating Requirements = 0.16 MM Btu/hr

Emission factor from AP-42 = 84 lb/10^6 cf

84 lb/10^6 cf × 1 cf/1,000 Btu × 10^6 Btu/1 MM Btu = 8.4E-2 lb/MM Btu

0.16 MM Btu/hr × 8.4E-2 lb/MM Btu = 0.01 lb/hr

0.01 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.1 ton/yr

Addition from No. 6 Fuel Oil Combustion:

Increased Heating Requirements = 3.28 MM Btu/hr

Emission factor from AP-42 = 5 lb/10^3 gal

5 lb/10^3 gal × 1 gal/150,000 Btu × 10^6 Btu/1 MM Btu = 3.3E-2 lb/MM Btu

3.28 MM Btu/hr × 3.3E-2 lb/MM Btu = 0.11 lb/hr

0.11 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.5 ton/yr

Addition from Tire-Derived Fuel (TDF) Combustion:

Increased Heating Requirements = 0.78 MM Btu/yr

Assume same as Bark = 0.60 lb/MM Btu

(EPA "Air Emission from Scrap Tire Combustion (600/R-97-115), Page 35 states emissions are similar to other fuels. Therefore assume similar to bark, which is 75% of the total heat input)

0.78 MM Btu/hr × 0.60 lb/MM Btu = 0.47 lb/hr

0.47 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 2.1 tons/yr

Total Emissions:

6.84 + 0.01 + 0.11 + 0.47 = 7.47 lbs/hr

29.9 + 0.1 + 0.5 +2.1 = 32.5 tons/year

Volatile Organic Compound (VOC) Emissions

Addition from Bark Combustion:

Increased Heating Requirements = 11.39 MM Btu/hr

Emission factor from NCASI TB 646 = 3.4E-2 lb/MM Btu

11.39 MM Btu/hr × 3.4E-2 lb/MM Btu = 0.39 lb/hr

0.39 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 1.7 tons/yr